



National Transportation Safety Board Aviation Accident Final Report

Location:	MIAMI, FL	Accident Number:	MIA94FA001
Date & Time:	10/03/1993, 1555 EDT	Registration:	9YTHR
Aircraft:	MCDONNELL DOUGLAS MD-83	Aircraft Damage:	Substantial
Defining Event:		Injuries:	1 Serious, 1 Minor, 80 None
Flight Conducted Under:	Part 129: Foreign		

Analysis

THE WATER HEATER IN THE FORWARD GALLEY EXPLODED. EXAMINATION REVEALED THAT THE CONTACTS OF THE WATER HEATER RELAY, WHICH, WHEN ENERGIZED, PROVIDES ELECTRICAL POWER TO THE 3 HEATER ELEMENTS, WERE ROUGH, RAGGED, DISCOLORED, AND SHOWED EXCESSIVE EROSION. ACCORDING TO THE MANUFACTURER, WHEN A RELAY EXCEEDS ITS LIFETIME, IT IS POSSIBLE FOR EROSION AND WEAR ON THE SURFACE TO CAUSE THE CONTACTS TO STICK IN THE CLOSED POSITION. IN ADDITION, THE PRESSURE RELIEF VALVE, WHICH IS DESIGNED TO CRACK AT 65 PSI, WAS TESTED TO 300 PSI WITHOUT CRACKING. UPON DISASSEMBLY, THE O-RING WAS FOUND TO HAVE MIGRATED FROM ITS NORMAL LOCATION INTO THE LOWER VALVE BODY WHERE IT LODGED BETWEEN THE INSIDE DIAMETER AND THE HEAD OF THE POPPET. IN THIS CONDITION, THE O-RING PRESENTED A COMPLETED FLOW BLOCKAGE AND PREVENTED THE PRESSURE RELIEF VALVE FROM OPENING.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: THE FAILURE OF THE WATER HEATER RELAY AND THE OVERPRESSURE RELIEF VALVE TO OPERATE PROPERLY. IN ADDITION, THE DESIGN OF THE RELIEF VALVE WAS INADEQUATE IN THAT IT ALLOWED THE O-RING TO MIGRATE FROM ITS NORMAL POSITION PREVENTING THE VALVE FROM OPENING.

Findings

Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION

Phase of Operation: CLIMB - TO CRUISE

Findings

1. (C) MISC EQPT/FURNISHINGS,GALLEY - LIFE EXPIRED
2. (C) MISC EQPT/FURNISHINGS,GALLEY - INOPERATIVE
3. (C) ACFT/EQUIP,INADEQUATE DESIGN - MANUFACTURER
4. (C) MISC EQPT/FURNISHINGS,GALLEY - PRESSURE EXCESSIVE

Occurrence #2: EXPLOSION

Phase of Operation: CLIMB - TO CRUISE

Findings

5. MISC EQPT/FURNISHINGS,GALLEY - EXPLODED

Factual Information

HISTORY OF FLIGHT

On October 3, 1993, about 1555 eastern daylight time, 9Y-THR, a McDonnell Douglas MD-83, experienced an explosion in the forward galley during climb to cruise altitude. The airplane was registered to and operating as British West Indies Airlines [BWIA] flight No. 431, scheduled, international, passenger service from Miami, Florida, to Barbados. The airplane was substantially damaged, 1 flight attendant received serious injuries, 1 flight attendant received minor injuries, 82 persons were not injured. Visual meteorological conditions prevailed at the time and an IFR flight plan was filed. The flight had originated from Miami, Florida, about 1525 and landed back at Miami, Florida, around 1625 the same day.

Examination of the airplane revealed that a water heater, Nordskog model, had over pressurized and exploded. The entire forward galley and the cabin wall to the cockpit was destroyed. The water heater was removed and examined at the NTSB laboratory. All failures noted were consistent with overload. The over pressure valve was examined and the "O" ring had migrated blocking the valve "Pop Off" function. The electrical contacts to the heater element were found failed in a way that allowed constant power to the element. Details of these examinations are included in this report as attachments.

Pilot Information

Certificate:	Airline Transport	Age:	39, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 1 Valid Medical--no waivers/lim.	Last FAA Medical Exam:	08/24/1993
Occupational Pilot:	Last Flight Review or Equivalent:		
Flight Time:	8500 hours (Total, all aircraft), 4200 hours (Total, this make and model), 220 hours (Pilot In Command, all aircraft), 200 hours (Last 90 days, all aircraft), 65 hours (Last 30 days, all aircraft), 4 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	MCDONNELL DOUGLAS	Registration:	9YTHR
Model/Series:	MD-83 MD-83	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Transport	Serial Number:	49568
Landing Gear Type:	Retractable - Tricycle	Seats:	138
Date/Type of Last Inspection:	09/12/1993, Continuous Airworthiness	Certified Max Gross Wt.:	160000 lbs
Time Since Last Inspection:	162 Hours	Engines:	2 Turbo Jet
Airframe Total Time:	14657 Hours	Engine Manufacturer:	P&W
ELT:	Installed, not activated	Engine Model/Series:	JT8D-219
Registered Owner:	BRITISH WEST INDIES	Rated Power:	20000 lbs
Operator:	BRITISH WEST INDIES	Operating Certificate(s) Held:	Flag carrier (121)
Operator Does Business As:		Operator Designator Code:	BWIA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	MIA, 16 ft msl	Distance from Accident Site:	100 Nautical Miles
Observation Time:	1550 EDT	Direction from Accident Site:	350°
Lowest Cloud Condition:	Scattered / 9000 ft agl	Visibility	7 Miles
Lowest Ceiling:	Overcast / 14000 ft agl	Visibility (RVR):	0 ft
Wind Speed/Gusts:	5 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	330°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	30 inches Hg	Temperature/Dew Point:	26° C / 23° C
Precipitation and Obscuration:			
Departure Point:		Type of Flight Plan Filed:	IFR
Destination:	BARBADOS, OF (TBPB)	Type of Clearance:	IFR
Departure Time:	1520 EDT	Type of Airspace:	Class E

Wreckage and Impact Information

Crew Injuries:	1 Serious, 1 Minor, 4 None	Aircraft Damage:	Substantial
Passenger Injuries:	76 None	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	In-Flight
Total Injuries:	1 Serious, 1 Minor, 80 None	Latitude, Longitude:	

Administrative Information

Investigator In Charge (IIC):	ANDREW A ALSTON	Report Date:	11/01/1994
Additional Participating Persons:	HAAKON WEISS; MIAMI, FL JOHN DELISI; WASHINGTON, DC		
Publish Date:			
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at pubinq@ntsb.gov , or at 800-877-6799. Dockets released after this date are available at http://dms.nts.gov/pubdms/ .		

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The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).